



Figure S7: Variation of Fig. 9 (i.e., of computer simulation 4) with the weight-dependent STDP rule proposed in [23]. This rule is defined by the following equations:  $\Delta w_+ = \lambda w_0^{1-\mu} w^\mu e^{-|\Delta t|/\tau_+}$  and  $\Delta w_- = \lambda \alpha w e^{-|\Delta t|/\tau_-}$ . We used the parameters proposed in [23], i.e.  $\mu = 0.4$ ,  $\alpha = 0.11$ ,  $\tau_+ = \tau_- = 20\text{ms}$ ,  $\lambda = 0.1$  and  $w_0 = 72.4\text{pS}$ . The  $w_0$  parameter was calculated according to the formula:  $w_0 = \frac{1}{2} w_{\max} \alpha^{\frac{1}{1-\mu}}$  where  $w_{\max}$  is the maximum synaptic weight of the synapse. The amplitude parameters of the reward kernel were set to  $\alpha_P = -\alpha_N = 1.401$ . All other parameter values were the same as in computer simulation 4. The variance of the membrane potential increased for pattern  $P$  from  $2.35(mV)^2$  to  $3.66(mV)^2$  (panel C), and decreased for pattern  $N$  (panel D), from  $2.27(mV)^2$  to  $1.54(mV)^2$ .